Community Modeling Initiative

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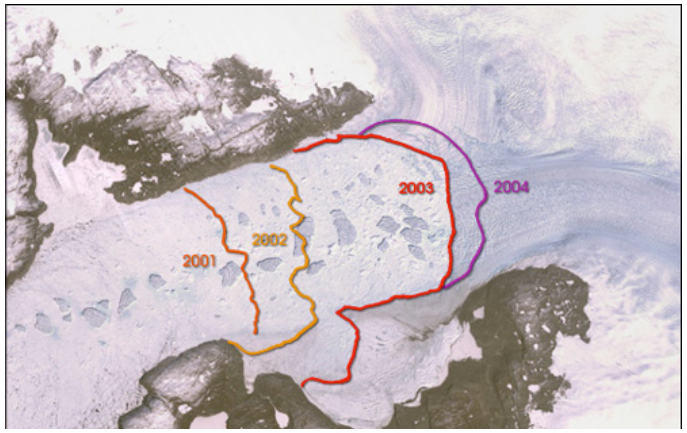
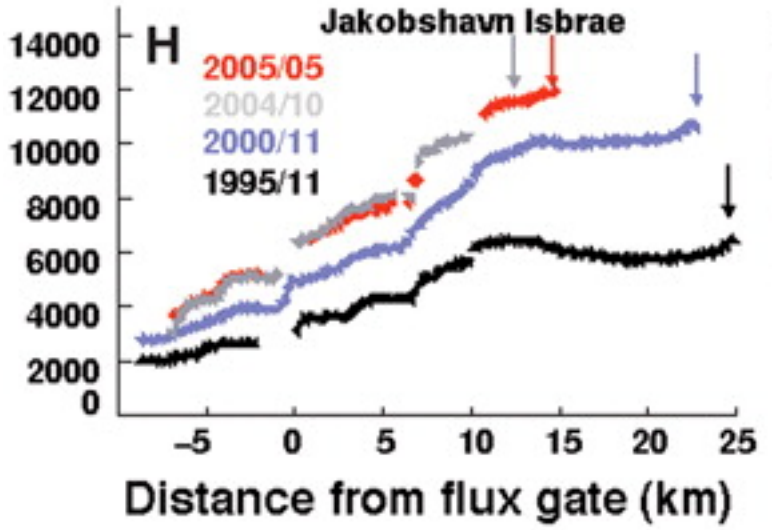
Motivation: global sea-level

IPCC 2001 projections

"The ranges are narrower than in TAR mainly because of improved information about some uncertainties in the projected contributions."

Wildcard in the deck?





Greenland's mass loss doubled in the last decade:

- **0.23 ± 0.08 mm slr / yr in 1996**
- **0.57 ± 0.1 mm slr / yr in 2005**

- **2/3 of the loss is caused by ice dynamics**
- **1/3 is due to enhanced runoff**

Rignot and Kanagaratnam, Science (2006)

Recent rapid changes in Greenland and Antarctica

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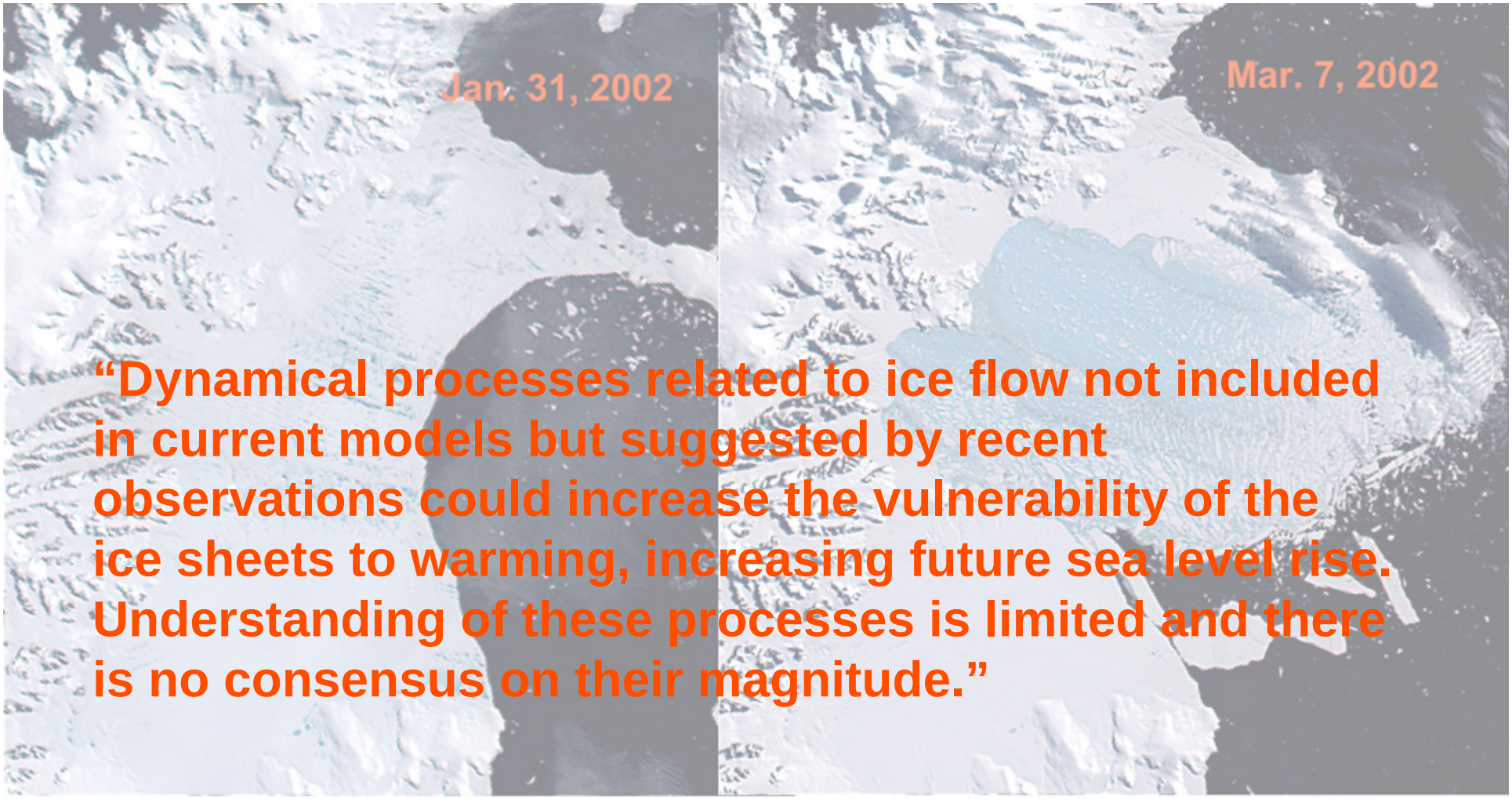
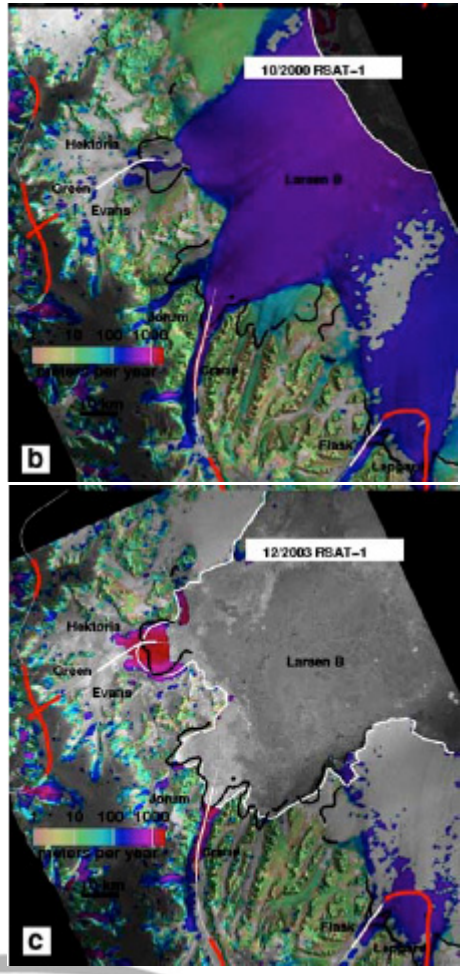


"Dynamical processes related to ice flow not included in current models but suggested by recent observations could increase the vulnerability of the ice sheets to warming, increasing future sea level rise. Understanding of these processes is limited and there is no consensus on their magnitude."

IPCC Summary For Policy Makers (2007)

Challenges for Glaciologists

- Improve understanding of processes associated with rapid ice-sheet changes
- Develop quantitative prognostic models
- Incorporate these smaller-scale processes into whole ice-sheet models



Community Modeling Initiative

- Bring together various modeling groups/efforts
- Stronger interaction between data collection and modeling efforts
- Ensure data collection is geared towards improving physical understanding
- Ensure modeling efforts are driven by data
- Develop broader programmatic initiative

Model Validation

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Subject to Further Editorial Correction

Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond

Committee on Earth Science and Applications from Space:
A Community Assessment and Strategy for the Future

Space Studies Board
Division on Engineering and Physical Sciences

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"Evaluation and assessment of model capability will increasingly be the focus of future measurement activities. Demonstrating model capability is likely to be a driver for developing and evolving observation systems and field campaigns."

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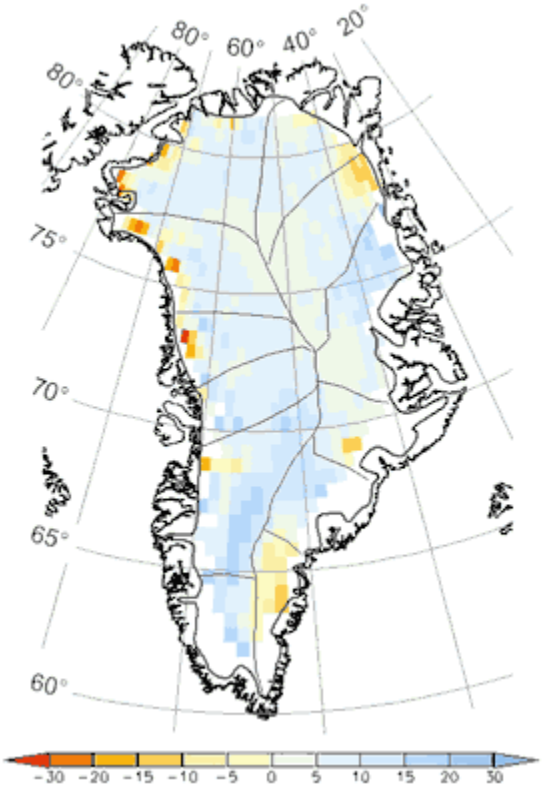

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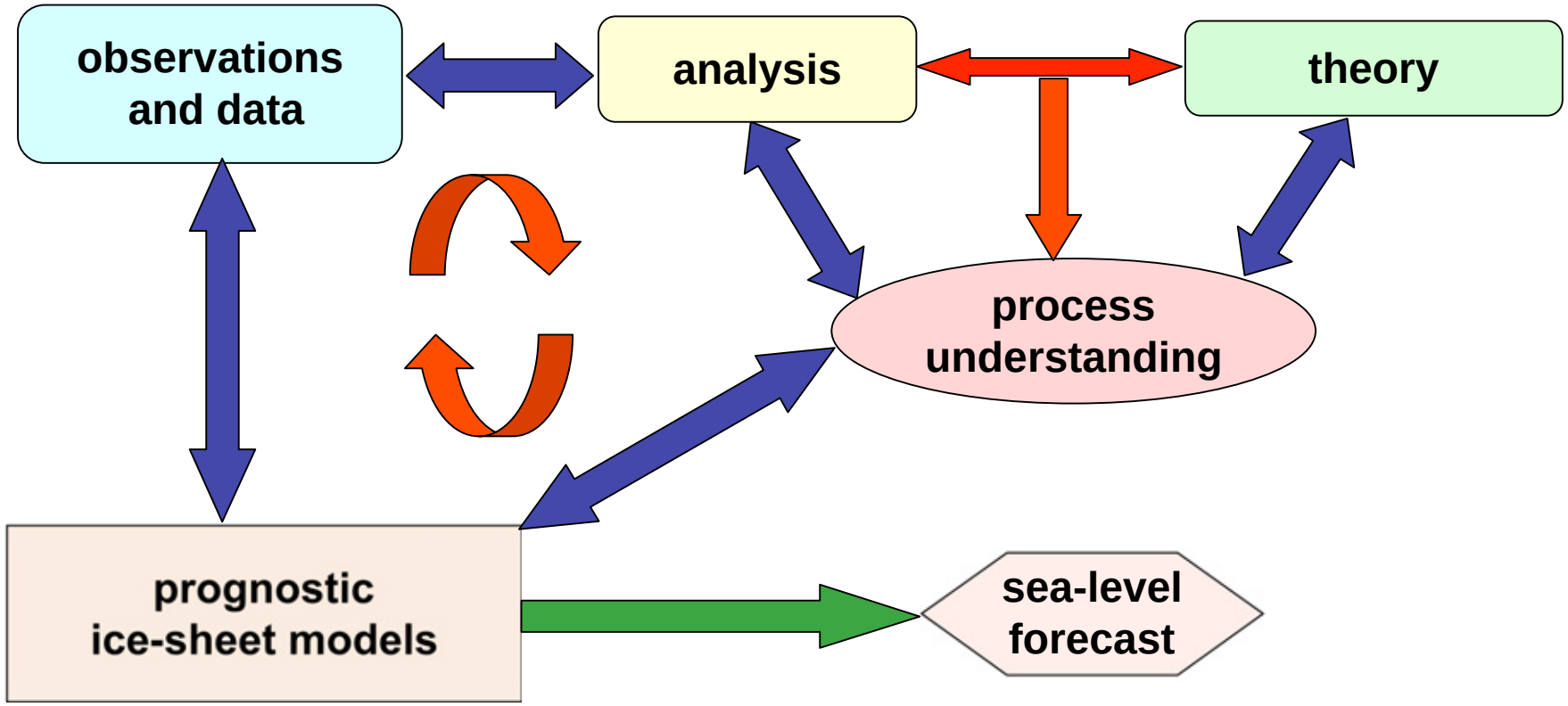
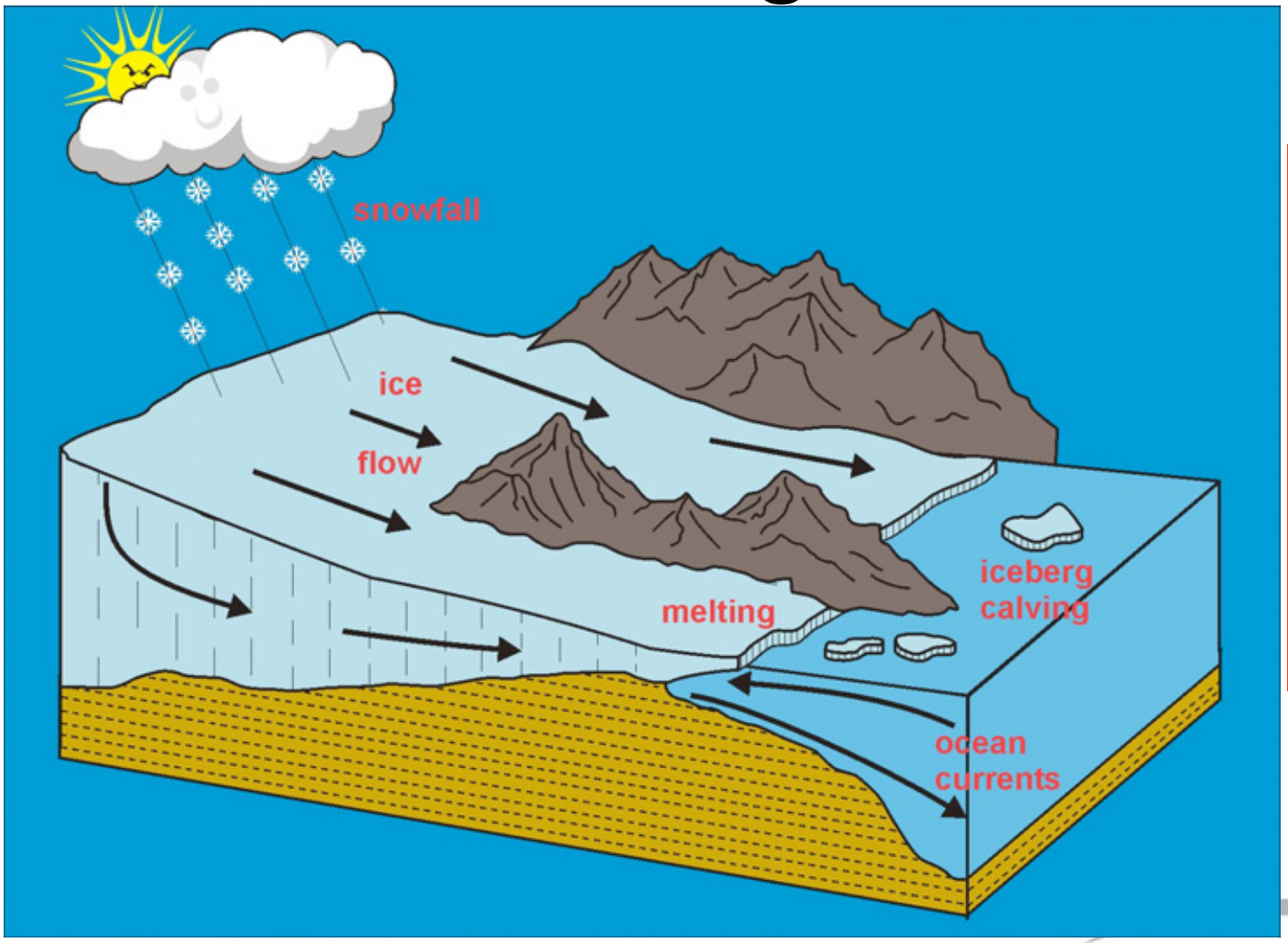
Rationale for Modeling Initiative

- Towards the next generation of ice-sheet models
- Reducing uncertainties in sea-level forecasts
- Assess probability of non-linear ice-sheet response
- Coordinate various ongoing efforts

Why a Modeling Initiative?



Modeling Ice Sheets



- Englacial processes
- Surface forcing
- Basal conditions
- Marine margin
- Numerical issues

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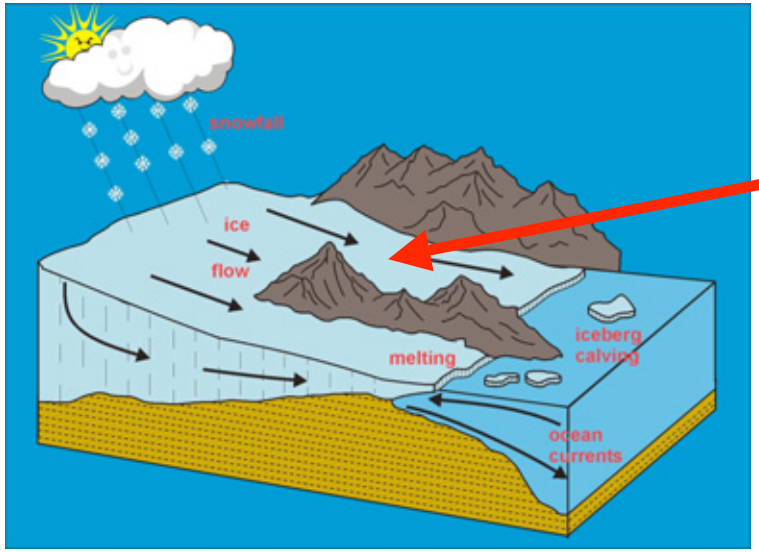
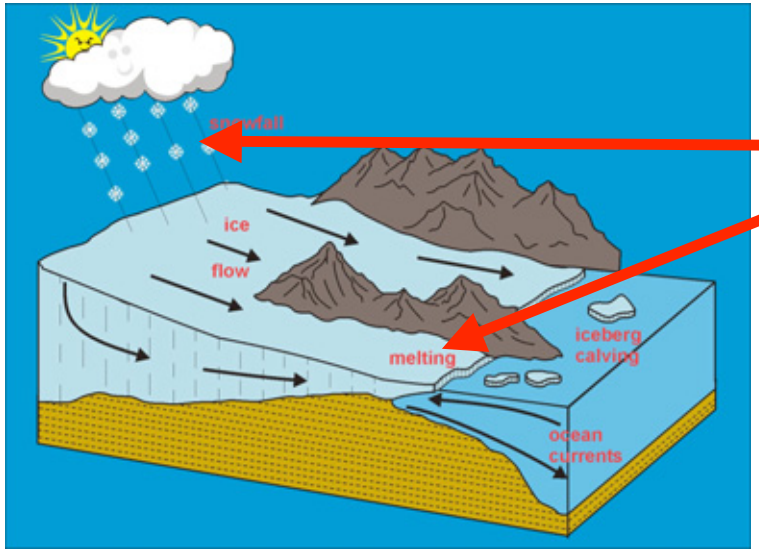
Englacial Processes



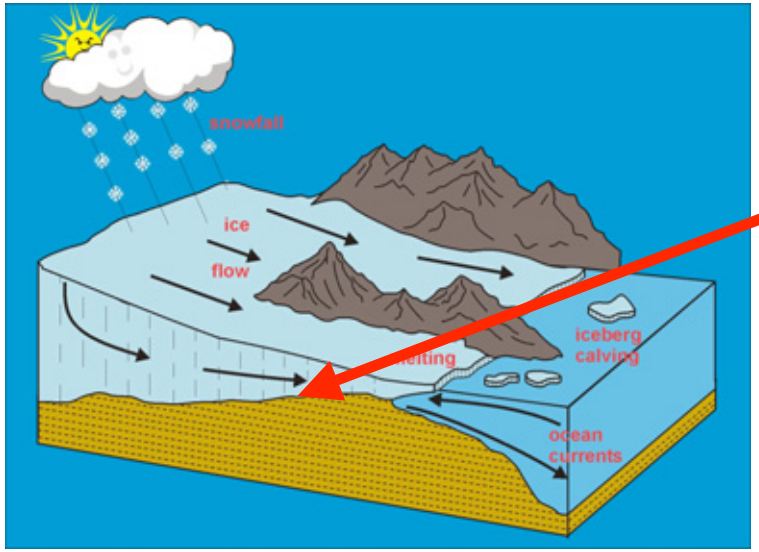
- controls on ice-stream flow
- effect of ice-shelf break up
- inherently unstable system?

Surface Processes



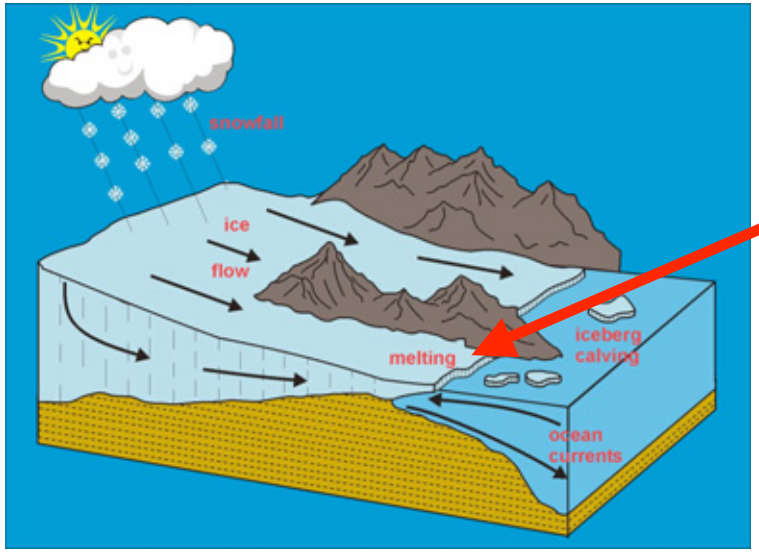
- **snowfall**
- **surface melting**
- **impact of glacier changes on (local) climate**

Basal Conditions



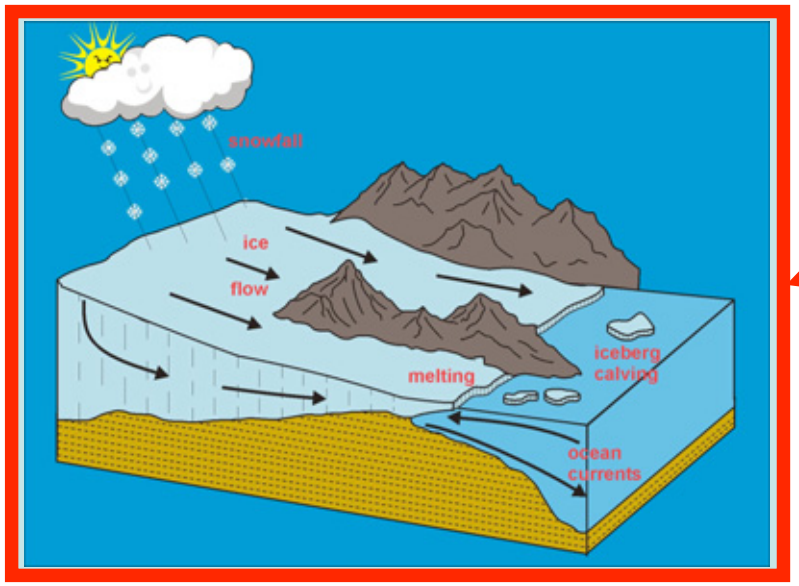
- **meltwater input from the surface**
- **deforming sediments**
- **basal topography and geothermal heat flow**

Marine Margin



- why do ice shelves disintegrate?
- role of ocean circulation
- break up of sea ice

Numerical Challenges

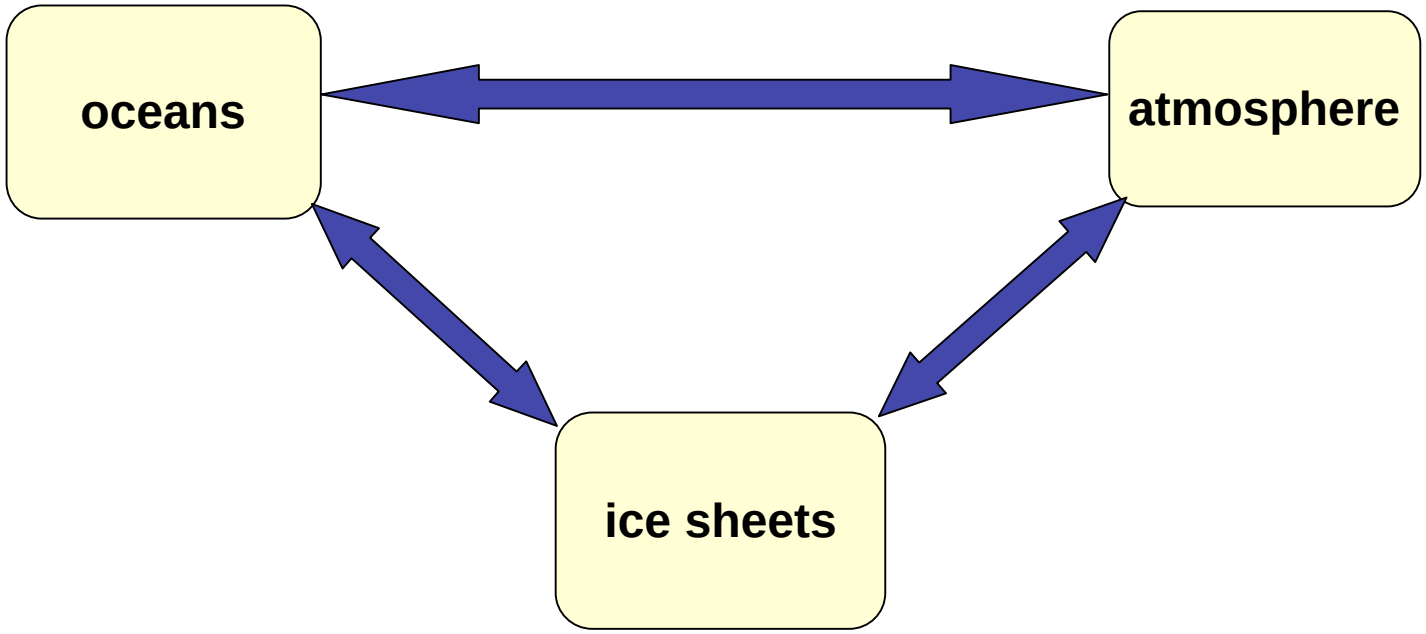


- **how to incorporate small-scale processes into whole ice-sheet models?**
- **how to link ice-sheet models to GCMs?**

Strategy

- Planning meeting at AGU (Dec. 2006)
- Discuss draft Plan during MGM (Mar. 2007)
- Present Plan to ISMASS (July 2007)
- Establish working groups
- Annual workshops
- International symposium (2010)

Ice Sheets and Global Modeling Framework



The study of the whole Earth System provides a research framework essential to the solution of global problems.

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WHERE DISCOVERIES BEGIN

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